

to wash out the nutrients or even cause it to tip over. Only rarely were the pitchers filled to more than a third of the lower swollen portion.

After 4-5 hours, with rain and sun alternating at 20-minute intervals, we commenced the descent, still keeping a look-out for alata-shaped urns. Then at last, when we had almost reached the lower limit of the nepenthes, Irmgard slipped at just the right place, inflicting some scratches on her leg, but bringing in front of my camera-lens an unfamiliar shape. The brown colour was in itself unusual, the lower swollen section was neither spherical nor barrel-shaped, and it was succeeded by a narrow 'neck', from which an oval peristome led obliquely up to the lid. The nearly circular widening of this horny margin of the trap, which gives *N. pervillei* it's typical amphora-like appearance, was completely lacking; thus giving a resemblance to the alata-type. However the round lid showed that at most this was a hybrid with some earlier species formerly living in the now-demolished primeval forest lower down the slope and *N. pervillei* growing on the summit. In addition to the shape and colour, the tendril between leaf and trap was appreciably longer than in the other carnivorous plants alongside. It remains an interesting question for some nepenthes specialists to investigate as to whether some second species did in fact exist there or perhaps even still persists on Silhouette (or if that all is only a variation of the well known *N. pervillei*). If anyone wishes to investigate the matter, we strongly recommend he gets in touch with:

Basil Beaudouin - Macabee - Mahe - Seychelles.

He is always delighted to make contact with carnivorous-plant enthusiasts, and his charges are both reasonable and affordable. It remains true that the Seychelles represent an expensive long-haul, but if anyone is after all able to fly there and to find out anything new about the pitcher plants (or 'Liane pot a eau') there, I would greatly appreciate hearing about it. Irmgard and I have the warmest recollections of Basil and his dream-islands with their nepenthes-peaks.

A summary of our CP-searches, with pictures of the debatable second species, can be seen on our new video (approx. 1 hour) entitled 'Insectivorous Plants Video 1993' (German language), which will be available at the end of February 1993. Further, there will be a treatment of Australian tuberous *Drosera* (In German = Onion-*Drosera*) which do not have onions. *Roridula* bugs are examined also in close-up and there is some account of the CP-year 1992 (AGM, Swiss meeting at Aarburg etc.) and a CP-quiz with real prizes. For the time being I hope I have succeeded in conveying to those unable to fly to the Seychelles some impression of the fascination of this tropical paradise.

Notes on Some *Darlingtonia californica* Torr. Bogs

by

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Introduction

In 1988 we made a trip to northern California and Oregon to observe *Darlingtonia*

bogs which the senior author had visited in 1982. New stations for Darlingtonia were also sought for in the Siskiyou National Forest. The Siskiyou is considered a botanists' paradise since it forms a bridge between the Cascade and Coast Range Mountains. As a result plants mingle here which are found in areas north, south, east and west with more than 1400 species being accounted for. Thus the Siskiyou was considered by us to be a valuable research area to examine the habitat of the Cobra Lily.

Darlingtonia californica is called the Cobra Lily because of its similarity to a snake about to strike. The upright position of the leaf, head like appearance of the globose blade and the downward pointing appendages which look like fangs all conspire to evoke this image. Quite an elaborate construction but very useful for this effective insectivorous plant.

Discussion

August was selected as the month for our expedition due to the heat and humidity which we wanted to escape on the east coast. Previous experience had shown that the northwestern U.S. coast was both cool and comfortable during August. July - August is the warmest time of year in this part of Oregon with average temperatures of 14 - 18° C. The coldest month is January with temperature averages from 4 - 8° C. Average annual temperature ranges from 6 - 12° C. An example of the comfortable sleeping conditions we enjoyed was a temperature of 9° C on 8/23/88 when we camped at an elevation of 840 meters in Indian Creek County, Oregon.

The significance of these cool temperatures should not be lost on potential growers of Darlingtonia. We have found it virtually impossible to grow Darlingtonia for any length of time in Virginia under outdoor cultivation. We believe this horticultural dilemma is caused by some essential differences in climate between the northwest U.S. mountain Darlingtonia bogs and the southeast U.S. coastal plain. We have not collected environmental data on the coastal Darlingtonia bogs although one site we visited appeared to have summer root temperatures similar to bogs we examined elsewhere in the species range. Mountain Darlingtonia bogs are located in regions of low relative humidity and are fed by cool spring waters. Low relative humidity allows evaporational cooling from the bogs and enhances local cool growing conditions. In addition, our observations showed a lower average temperature than the southeast U.S. For example, average July wet-bulb temperatures are less than 15° C in the northwest compared to 21-24° C in the southeast.

Southern U.S. summers tend to be hot and humid for protracted periods. This extended heat and humidity is apparently detrimental to outdoor cultivation of Darlingtonia californica in this region of the country. We have planted Darlingtonia in sphagnum bogs where the water temperature does not exceed 21° C and had 100% mortality. Schnell (1976) states a maximum soil temperature of 20° C and Brownfield (1985) recommends not exceeding 17° C. Our transplants tend to confirm that the 20° C temperature must be the absolute high end of tolerance for this species. Where possible we would advise lower temperatures.

Perhaps the plants become susceptible to bacterial and fungal attack due to heat stress. Another idea we have is that possibly a beneficial fungal root associate, much as in orchids, may not survive well in the southeast and thus the Cobra Lily does not persist in cultivation under higher temperatures. We have seen two cases where growers in the east have successfully grown Darlingtonia in pots employing

evaporational cooling in shaded greenhouses or air conditioned enclosures. It would appear though that for whatever reasons cool root temperatures are an important key to successfully raising Darlingtonia in cultivation.

Geology and Climate

With the exception of the Gasquet bog, our investigations were focused on the Siskiyou National Forest located in southwestern Oregon. This area is in the Warm Temperate Subalpine Region with a natural vegetation of Western Hemlock and Mixed Needleleaf-Broadleaf Forest. Continental temperature extremes are moderated by the cool Pacific Ocean and the decrease in temperature with elevation is 1° C for every 275 meters. In contrast the world average is 1° C for every 150 meters.

The soils of this area (the Klamath Mountains) are classified as Inceptisols and Alfisols. They are largely light colored, medium to slightly acid, loamy, stony and shallow. Areas of granite are characterized by sandy soils and serpentine areas are mostly shallow, reddish, clayey soils. The Kalmiopsis area (within Siskiyou National Forest) is underlain by peridotite and serpentine. These may be remnants of sub-crustal rock brought up from great depths by plate movement.

Observations

Below is a chart listing the temperature and pH data we collected at midday at the various sites on our trip.

Environmental Data from Darlingtonia californica habitats

As you can see the plants were largely growing with root temperatures averaging 14°, air temperature 22°, water temperature 13° C and pH slightly above neutral.

Some comments from our notes on these sites are as follows:

Site 1

Gasquet Bog.

A rocky spring fed mountain creek with organic vegetated borders. Large clumps of Darlingtonia californica to 81 cm. tall growing along with shrubs on border of creek and in sunny openings. Pinguicula vulgaris and Drosera rotundifolia noted with Tofieldia glutinosa in full flower. Seeds of Darlingtonia ripe in capsule on 8/21/88. Insect predation of ovary noted.

Site 2

Hunter Creek Bog.

Located at 853 meters approximately five miles east of Cape Sebastian Park and the Pacific Ocean and 1 mile before entering the Siskiyou National Forest. A round, flat peat bog with a forested perimeter grading to an open center. A slow moving, shallow, crystal clear, meandering stream through site. Drosera rotundifolia local on dead logs. Large numbers of Darlingtonia californica and numerous seedlings. Robust root growth of young plants on borders of pools and stoloniferous invasion of open aquatic habitat. Hummocks, rocky streams and open bog center principal growth areas. Some clumps of Darlingtonia measured 3 meters across and 94 cm. tall. Yellow

jackets observed being primary victims of Darlingtonia and sweet fragrance from pitchers easily noted in site.

Site 3
Flycatcher Springs.

Several sites in close proximity in rocky, spring fed drainages. Large numbers of Darlingtonia.

Site 4
Snow Camp Meadow.

The best site observed. This is a large naturally open mountain meadow possibly formed by mass wasting (the collapse of the supporting rocks and side of the mountain) of part of Snow Camp Mountain resulting in a broad mountain terrace. The site grades from dry meadow to wet, sopping bog. Bog characterized by slow moving clear, cool streams with open pools in center of site. A few red salamanders observed in pools. Pools noteworthy for formation of peat masses which looked like rocks. Numerous additional seepages throughout site. Nuphar polysepalum growing in open pools with Rudbeckia californica, Parnasia palustris and Tofieldia glutinosa in full flower throughout open springy meadow. Shaded woodland Darlingtonia measured to 61 cm. while full sun plants averaged only 20 cm..

Site 5
Saddle Mountain.

A moist spot on an otherwise dry hillside/ravine. No moisture outlet found and site measured only 5 square meters.

Site 6
Huntley Springs.

A very rocky creek with clumps of Darlingtonia growing out of rock crevices and on mossy, moist rocks.

Conclusion

I would highly recommend the Siskiyou National Forest to people interested in Darlingtonia in particular and nature in general. We actually found Darlingtonia to be a fairly predictable plant to find. The primary habitat was rocky spring fed seeps and wet mountain meadows with soil and water temperatures averaging 14 and 13° C and air temperature averaging 22° C. Water pH was slightly above neutral. Evaporational cooling of leaves and cool spring water appeared to be important strategies for survival although root associates may also be important. Darlingtonia produces a pleasant scent noticeable in the bogs which was especially attractive to the yellow jacket wasp.

Recommendations

Our exploration was confined to one small area of the Siskiyou National Forest and I am sure there are many more interesting bogs to be found. The forest contains one million acre



Figure 1 - Hunter Creek Bog - notice crystal clear water and abundant D. californica growth.



Figure 2 - Hunter Creek Bog - clump of D. californica growing on dead log.



Figure 3 - Open pools and clear, slow flowing streams of Snow Camp Meadow. Note very gentle slope to site and stoloniferous invasion of pools by D. californica.

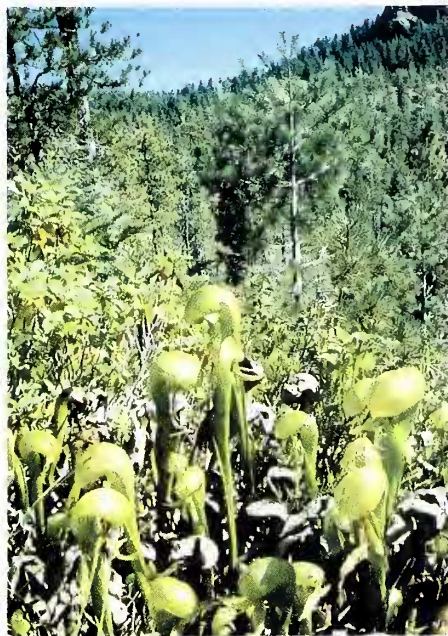


Figure 4 - D. californica growing on moist side of hill opposite Pyramid Rock.

s and has five designated wilderness areas so there is plenty to see and discover.

There is a primitive campground near Fairview Mountain which contains virgin Douglas Firs reaching 1.2 meters in diameter. Camping here is quite an experience and reminds one of the forest primeval. If you desire to see the sites mentioned in this article I would recommend this as a central campsite from which to explore the area.

Our trip in the Siskiyou National Forest was greatly aided by using a current forest service map. For additional information on planning a trip to this area contact the Siskiyou National Forest Headquarters, 200 N.E. Greenfield Road (P.O. Box 440), Grants Pass, Or. 97526

Special Note: VHS videotapes of the above mentioned sites are available from the senior author for \$20.00 plus postage.

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ICPS Informal Gathering

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The First Informal Gathering was held August 7-9, 1992, at the home of Carl and